

measuring more than 10 feet 6 inches in the skin. He saw the skin of one at Dinagepore, over 12 feet in length; this was also no doubt stretched. Col. J. Macdonald has killed a tiger of 10 feet 4 inches. He says: "I do believe tigers have exceptionally reached 12 feet."

The Hon. R. Drummond, C.S., killed a tiger 11 feet 9 inches in length before being skinned.

Col. Shakespeare killed a tiger of 11 feet 8 inches.

In regard to the allusion to Buffon's tiger of 15 feet, and Hyder Ally's of 18 feet, I refer to but to express my distrust of them.

It is needless to adduce further evidence. I repeat that though male tigers over 10 feet may be uncommon, they do occasionally (and I said no more) attain the greater size.

June 17

J. FAYRE

### Zoological Geography

IN the annual address of the President of the Geological Society of London, just issued, an extract is given by anticipation from the forthcoming work of Dr. Günther, on the gigantic land-tortoises, wherein that naturalist discusses the question of the geographical connections by which the tortoises of the Mascarene region may have been related to those which are found in the Galapagos Islands.

As neither in this extract nor in the presidential discussion do I find any allusion to the circumstance that, according to the paper of Dr. Litton Fortes, in the *Journal of the Geographical Society for 1877*, *Didunculus strigirostris*, a near congener of the Mascarene *Dodo*, is living in Upolu, one of the islands of the Navigator group, I venture to call attention to it. Since this island lies in 14° S. lat., and is distant 130° of longitude, in a direct line eastwards from the Mauritius, towards the Galapagos, the presence on it of this ground-bird seems to show that the ancient geographical connection from the Mascarene to the Galapagos Islands was eastwards across the Indian and Pacific Oceans, rather than, as Dr. Günther thinks, westwards by way of Africa, the Atlantic, and South America; for by it more than three-fifths of the 210° of longitude, which in the easterly direction separates the Mascarene region from the Galapagos, and presents a difficulty to Dr. Günther, are bridged over.

The Navigator group, together with a multitude of other islands in the South Pacific, which extend to within 40° longitude of the Galapagos, appear to be small remnants of that continent of very remote geological age of which Australia, New Guinea, and New Zealand constitute larger remnants; and perhaps I may be allowed to observe that the suggestion made by Dr. Günther in reference to the extinction of the gigantic tortoises, viz., that they may be supposed to have once spread over the whole of the large area which connects the places of their present occurrence, but to have been unable to survive the arrival of man or the large carnivora, is precisely that which, many years ago,<sup>1</sup> I offered as the explanation of the extinction of the great wingless, or ground-birds, wherever they were unprotected from these enemies by insulation. This formed part of the argument by which in 1860 I endeavoured to show to the Geological Society that most of the land-tracts of the southern hemisphere were remnants of an ancient continent, which had become insulated at different times during the secondary or mesozoic period.

SEARLES V. WOOD, JUN.

Martlesham, Suffolk, May 27

### Time and Longitude

IN NATURE, vol. vii. p. 68, the Rev. J. Pearson asked, "In what part of the globe and in what meridian does October 20 end and October 21 begin?"

The question was answered by several correspondents. Still the following may be interesting as a matter of fact in connection with Mr. Latimer Clark's letter in your issue of May 9:

The date was fixed in many of the Pacific Islands by the early missionaries, who, sailing eastward from Australia, kept the date of the eastern hemisphere after they had crossed the meridian of 180°. This imaginary boundary line cuts through the Fiji Islands, the principal islands of the group being in the eastern hemisphere. It would, of course, be inconvenient to have two dates in one group of islands, especially as the meridian of 180° passes through the north-east point of Vanua Levu, the island of

Taviuni, and another small island. Such an arrangement might possibly lead to the necessity (if a stickler for strict accuracy should build his house across the line) of a person going from one day to another by passing from one part of the house to another. It would, to say the least, be awkward to sleep during the night of October 20-21 and on arising on the morning of October 21, by simply walking into the breakfast-room, to cross the boundary-line, and find oneself back into the beginning of October 20.

The Tongan and Samoan Islands are a few degrees east of the meridian of 180°; consequently they ought to be a day behind the neighbouring Fiji group. But hitherto their chief commercial intercourse has been with Australia and New Zealand; and this, for the sake of convenience, has led to the date of the eastern hemisphere being retained up to the present time, although a change has been advocated in Samoa more than once.

In consequence of the present arrangement these little islands have the honour of leading the world in the matter of time, whereas they ought, according to their geographical position, to wind up the rear. There is, however, one drawback to the honour: all our dates, when compared with those of the rest of the world, need to be put back twenty-four hours. This should be remembered in connection with observations of natural phenomena. To obtain local time we add 12 hours 33 minutes to G.M.T. instead of subtracting 11 hours 27 minutes.

S. J. WHITMEE

### New Lunar Crater

I was much interested in the account which your last number (vol. xviii. p. 197) contained of the presumably new lunar crater discovered by Dr. Klein in the Mare Vaporum. Is it really necessary to ascribe the formation of such a crater to present volcanic action? It seems to me that this singular phenomenon of the birth of a new crater may be more likely owing to such action having, in long-past ages, left (as in all probability it would leave) extensive caverns beneath the visible surface of our satellite. Such caverns might, in consequence of the gradual changes which the action of the sun's rays, alternating with intense cold, must produce on the lunar rocks, occasionally give way. A crater-like cavity would then be caused on the moon's surface by this subsidence, such as are not unfrequently seen in mining districts where old workings have fallen in. The fact that the new crater is elliptical, and not round, seems to add to the probability of its having been caused by some such "settling" process. If the crater were produced by active volcanic agency, it would surely be circular, or nearly so. I do not find this mode of quasi-crater formation suggested in Nasmyth's book, nor, so far as I can remember, in any other. Is it not, however, a possible cause of change on the surface of our satellite?

EDWARD GREENHOW

Cardiff, June 22

### Opening of Museums on Sundays

I AM delighted to find from my friend Prof. Dyer's letter that I was mistaken in the belief that the Maidstone Museum was "the first and only scientific museum that has yet been opened on Sunday in the United Kingdom."

Still the fact that "the Botanical Museum of the Royal Gardens, Kew," is not closed when the Gardens are opened to the public on Sunday, a fact which I had overlooked, although important enough in itself, is not for a moment to be compared with the deliberate opening of the Maidstone Museum by the town authorities.

Had the Botanical Museum not been attached to the Royal Gardens there can be no doubt that it would still be closed on Sunday, as the British and South Kensington Museums are; the opening of one of these institutions would be a parallel case to that of Maidstone.

I am happy to be able to state that a motion for rescinding the resolution under which the Maidstone Museum was opened on Sunday has been defeated in the Town Council.

May I express a hope that there are many towns which will not long remain behind Maidstone in this matter.

ro, Bolton Row,  
Mayfair, W.

W. H. CORFIELD,  
Chairman of the Committee of the  
Sunday Society

<sup>1</sup> *Quarterly Journal of the Geological Society* for 1860, p. 329; *Phil. Mag.* for March, April, and May, 1862.

some months past, a fact of which the members of the British Association may take advantage this year. It is now Scotland's turn.

W. H. C.

#### Ophrys muscifera

On the afternoon of June 2, 1878, I observed some new facts, which, I think, are of importance in elucidating the hitherto mysterious fertilisation of the Fly-Orchis. In sunny weather and under normal conditions the labellum secretes fluid, and a broad central longitudinal stripe of its surface is covered with small drops. Of fifty fresh flowers I found the labellum in thirteen covered with drops, in twenty-five shining with adhering moisture, in twelve without any conspicuous trace of fluid. The two small shining projections on each side of the base of the labellum (the sham-nectaries of Sprengel) were quite dry in all the flowers. In one flower I saw a fly (*Sarcophaga* sp.) sitting on the labellum and licking the drops. Its head was directed towards the base of the labellum. On my approaching it flew away before having reached the sham-nectaries, and the flower visited by it was found without pollen on the stigmas, and with both pollinia in their cells. Nevertheless, it is most probable that this fly, if not disturbed by my approach, would have stepped forward on the labellum, and, trying one of the sham-nectaries, would have removed one of the pollinia and perhaps transferred to the stigma of another stem, in the manner described by Charles Darwin ("Fertilisation of Orchids," p. 47).

For observing the fluid secreted by the labellum it may be essential to examine plants in their native habitats, not plucked ones.

HERMANN MÜLLER

Lippstadt

#### The Jura

In the midst of the enjoyment of quiet and beautiful scenery I cannot refrain from writing, in the interest of geology, to attract attention to the facilities for the study of the Jura range afforded by a railway recently opened from Bâle, *via* Delémont and the Münster Thal, to Bienne. It crosses the range at, relatively to the anticlinal, a considerable angle, necessitating no less, as I am told, than twenty-five tunnels great and small (I did not count them myself).

Consequently, in a short morning's railway ride the traveller sees a vast deal of Jurassic structure, added to which the Münster Thal, formerly a rather tiring day and a half's drive, is replete with rock, forest, and pasture scenery of very great beauty.

Travellers thus crossing the Jura on their way to the Alps and returning from Lausanne by Vallorbes to Paris, will thank me, I think, for pointing out what, if only from a scientific point of view, are two recently-developed routes, far more interesting than the customary approaches to this land of wonders. I repress poetic and mountaineering sympathies.

Pension Mounoud, Vevyau-Chillon, MARSHALL HALL  
Canton Vaud, June 21

#### THE TRANSIT OF VENUS PHOTOGRAPHS<sup>1</sup>

THE photographs which have been measured were taken with the five photoheliographs made by Mr. Dallmeyer for the Transit of Venus expeditions, on "patent plates" 6 inches square, the images of the sun being very nearly 3.9 inches in diameter. The dry process of Capt. Abney was used throughout.

The measuring instrument, the determination of the errors of its glass millimeter scale, and the method of obtaining the optical distortion of the photoheliographs, have already been described in the Society's *Proceedings*. It has been found by an elaborate investigation that the lines of equal distortion were sensibly circles concentric with the centre of the field. The actual correction for distortion for that zone of the field in the points to be measured generally fell, was exhibited on the board, and was almost identical for all five instruments.

Before commencing the measures of a negative, the position of the line of centres was marked upon the film by a simple mechanical process. This operation has been performed independently by Mr. Burton and myself,

<sup>1</sup> Paper read by Capt. Tupman at the meeting of the R.A.S. on June 14, on the measurements of the Transit of Venus photographs.

with no sensible difference. I have paid no attention to the marks left by Mr. Burton on the plates, and found that my own coincided with them in direction.

In placing the negative in the instrument the circular carrier was turned about until the line of centres was truly parallel to the direction of the sliding motion of the microscopes.

When the negatives are placed under the microscope with an amplification of only five or six diameters, the limbs of both planet and sun, even those which are pretty sharp to the unaided eye, become extremely indistinct, and the act of bisecting a limb with the wire or cross of the micrometer is mere guess-work. The deposit of silver fades off gradually to nothing, and the denser the film the broader generally is the zone of fading off and the more uncertain the measures. In many cases the difficulty is aggravated by ruggedness due to atmospheric disturbances, but the smooth and gradual fading off is the chief cause of uncertainty.

There is only *one* really sharp picture in the whole collection, including the Indian and Australian contingents, and that is one of Capt. Waterhouse's wet plates, taken at Roorkee with a Dallmeyer instrument precisely similar to the others.

It should be remarked that in these instruments the artist has attempted to unite the photographic and visual foci on the collodion film. No doubt some sharpness of the photographic image was thus sacrificed, but this has little or nothing to do with the unfortunate failure of the photography generally.

Each photograph has been measured six times by Mr. Burton and six times by myself. I am not able to include in my series of measures all the photographs measured by Mr. Burton, for the reason that when some of them were viewed through the microscope I could see nothing to bisect, either from the extreme faintness of the film, or from its too gradual fading off.

Mr. Burton generally employed a cross of webs, but I have preferred a single very fine web, the breadth of which was eliminated in the mean by the mode of bisecting.

It had been suggested that the measuring instrument should possess the power of rotating the sun's image about a mechanical centre. This would be useful in some cases of rugged limbs when the sun's image was not rendered elliptical by refraction, but in my opinion would make no material difference in the accuracy of measurement. The rotation could only be applied to the limbs of the sun, whereas, perhaps, the greatest difficulty had been at the limbs of the planet.

From the measures, corrected for distortion, were obtained the photographic diameters of the sun and of *Venus*; the former presumably enlarged, the latter diminished by irradiation in a sensibly equal degree. The sum of the measured diameters in millimetres was compared with the sum of the tabular diameters, subject to errors, for the scale value, and thus every photograph furnished its own scale.

The measured distance of centres affected by errors of semi-diameter was then compared with the tabular distance affected by errors of parallax, right ascension, and north polar distance. From each photograph was formed an equation involving all the unknown quantities, of which the errors of parallax and of semi-diameters were the more important.

The rigorous solution of the equations resulting from Mr. Burton's measures is,

$$\text{Mean solar parallax} = 8''.165 - .209 (dR + dr)$$

$$,, \quad dR.A. \quad \dots = + 5'.38 + .287 (dR + dr)$$

$$,, \quad dN.P.D. \quad \dots = - 5'.10 - .882 (dR - dr).$$

The parallax deduced being absurdly small—altogether inadmissible, indeed—the Astronomer-Royal suggested that the quantity  $(dR + dr)$ , or the sum of the corrections to the tabular semi-diameters, should be considered the